

UNUSUAL OCCURRENCE REPORT

EG&G IDAHO, INC.

Page 1 of 8

1. UOR Number EG&G-85-17
Facility Number ATR-85-3
2. Status & Date Initial
* Interim
X Final 11-13-85

*NOTE: An interim report dated 7-18-85 was issued under this report number to include a fire main leak. A separate UOR number EG&G-85-41 has since been issued describing that occurrence. Reference to the contents of UOR EG&G-85-41 have been removed from this UOR.

3. Division or Project:

Test Reactor Area (TRA)
Test Reactor Programs Division
Idaho National Engineering Laboratory (INEL)

4. Facility, System, or Equipment:	5. Date of Occurrence:	6. Time of Occurrence:
Test Reactor Area (TRA) Hot Cell Entry Way	Identified 5-7-85	0900

7. Subject of Occurrence:

Radioactive Soil Contamination - Hot Waste Line Leakage

8. Apparent Cause: Design Material X Personnel Procedure
Other X (Explain in Item 14)

9. Description of Occurrence:

At approximately 0900 hours on 5/7/85, a Senior Engineer entered the TRA Hot Cells TRA 632 office area. Upon leaving the Hot Cells building he found that his shoes were contaminated. He placed shoe covers over his shoes and proceeded to the TRA 604 Health Physics office to get a more detailed contamination survey. This survey revealed that his shoes were contaminated to 30000 disintegration per minute by activity, (as surveyed by an Eberline HP 260 Detector assuming 10% efficiency for Cesium-137), however no other personnel contamination was found. While he was assisted in decontaminating the soles of his shoes, other Health Physics (HP) personnel isolated the Hot Cell building and commenced a contamination/radiation survey.

1. UOR Number EG&G-85-172. UOR Date 11-13-85

9. Description of Occurrence: (Cont'd)

No contamination levels above background were discovered in the Hot Cells office area. The engineer reconstructed his travel route from TRA 604 Lab 109 to the Alpha Labs and then to the Hot Cells office area. Health Physics Technicians performed contamination surveys of these areas, but found no contamination levels above background. Routine personnel surveys of the HP Technicians involved in the contamination surveys revealed that two of the HPs had low level contamination on their shoes. Temporary barriers were established and a comprehensive survey of the outside area between the TRA 635 building and the Hot Cell was initiated. This survey identified an area of contaminated soil between the Hot Cell building and the MTR Reactor Services (TRA 635) building. Radiation levels at ground level ranged to 500 mR/h maximum. See the attached Sketch No. 1 for radiation levels and contamination found.

Hand excavation of the soil was commenced on 5-11-85 and continued as weather permitted until 5-21-85. During this period, winds and rain limited excavation to approximately 2-3 hours per day.

On 5-21-85, laborers returning to work noticed a collection of water in the bottom of the excavation at the approximate location of the highest radiation levels shown on Sketch No. 1. The water then appeared to soak into the ground. An investigation revealed that a hot waste transfer had been completed between MTR Hot Catch tanks (TRA-730) and the 100,000 gallon Hot Waste Storage Tank located in TRA 605. It was apparent that the source of the radioactive water was a leaking Hot Waste line located approximately 30 feet laterally and 5-6 feet below grade from where the water collected in the excavation.

10. Operating Condition of Facility at Time of Occurrence:

The ATR was in the second day of Cycle 69A-1 shutdown and was not a factor in this occurrence. Only routine evolutions were occurring within TRA Hot Cells and the areas adjacent to the involved area.

11. Immediate Evaluation:

An unknown source of radioactive material had caused significant contamination of approximately 150 sq. ft. of soil and minor contamination of approximately 1000 sq. ft. of concrete.

1. UOR Number EG&G-85-17

2. UOR Date 11-13-85

12. Immediate Action Taken and Results:

1. Barriers, radiological posting and controls were established to prevent additional personnel contamination.
2. The HP Technicians and engineers shoes were decontaminated.
3. The soil was covered with polyethylene and plywood to prevent further spreading of contamination.
4. DOE-ID and EG&G Management personnel were notified.
5. A survey was conducted to locate the extent of the contamination in adjacent building; no contamination was found.
6. A survey was conducted of a truck that had departed from an adjacent building; no contamination was found.
7. Radionuclide determination was made. Cesium 134 and Cesium 137 were the major constituents.

13. Is Further Evaluation Required? Yes No X

If Yes, Before Further Operation? Yes _____ No X

If Yes, By Whom? _____

When?

14. Final Evaluation and Lessons Learned.

The waste piping was uncovered by excavating approximately sixty cubic feet of concrete and thirty-six cubic yards of radioactively contaminated soil. A visual inspection of the waste line was completed. The inspection of the waste line showed the general condition of the waste line to be free from corrosion on the external surfaces and in general, appeared to be without generic problems.

The waste line was, however, damaged. The pipe near the elbow was bent and deformed as a piece of tubing would deform under a bending stress with deformation on the top and bottom surfaces..

The waste line was pressurized with non-radioactive water to ascertain the location of the leak(s). Leaks were found at three locations. The weld, adjoining the elbow and the pipe, was found to leak around the circumference of the weld. In addition, leaks were noted at the location where the piping had been damaged at the top and bottom of the piping. The defects were welded shut and another pressure test completed to verify that all the leaks were found. No additional leaks were located.

The defective elbow and approximately four additional feet of piping on each side of the elbow were removed and replaced with new material. The piping was hydrostatically tested and returned to service.

1. UOR Number EG&G-85-172. UOR Date 11-13-85

14. Final Evaluation and Lessons Learned: (Cont'd)

The original source of contamination was detected approximately 30 feet away from the broken pipe. There are two factors that caused the water to come to the surface of the ground at that specific location. The entire area for at least 30 feet in all directions was covered with concrete approximately fifteen inches thick. This prevented the water from coming to the surface directly above the leak. A firewater main system was installed near the location of the waste line leak in 1978. The ground was disturbed during the firemain installation. When the leak occurred, the firemain trench acted as a path of least resistance to the surface.

Prior to February 1985, radioactive liquid waste that could not be processed by the TRA Liquid Radioactive Waste Cleanup System because of chemical constituents or high radioactivity would be pumped to the TRA Hot Waste Storage Tanks (TRA-713), which are located below ground level. Starting in February 1985, waste was routinely pumped to an above ground 100,000 gallon storage tank located in building TRA 605. The elevation difference between the above ground tank and the underground tank would have caused the pressure in the waste line to be approximately fifteen psi higher when pumping to the above ground tank.

It is not known when the hot waste line started leaking, however, it is believed that changing the normal storage location from the underground tanks to the above ground tanks resulted in an increase in pressure which was sufficient to cause the water to reach the ground surface at the nearest point. The ground during the month of February was frozen and prevented the waste water from reaching the ground surface. The spring thaw which would have occurred in late April or early May, permitted the waste water to rise to the surface where it was subsequently discovered.

The exact cause of the damaged waste line has not been determined. However, the mechanical damage which was observed was felt to have occurred either during the installation of the firewater main or after installation during ground settling. A firewater main concrete thrust block corner was located approximately one to two inches from the damaged waste line.

The migration of the radioactive water after the leak started, followed the adjacent trenches. This occurred because the disturbed earth in the trenches represented the path of least resistance for the water flow. The mechanical damage to the waste line was apparently caused either during or subsequent to the fire main installation several years before. Care needs to be exercised whenever underground excavation occurs adjacent to existing underground utilities.

1. UOR Number EG&G-85-17

2. UOR Date 11-13-85

15. Corrective Action:

Taken X Recommended _____ To Be Supplied _____

1. A plan has been developed to identify the source of the radioactive contamination and to contain existing contamination. Completion of this plan will identify additional corrective action. Air monitoring was established downwind to verify that the spread of contamination did not occur during clean-up activities.

Action: TRA Waste Coordinator, Safety,
Installation & Modifications
Branch (I&M)

Date: Completed

- a. Provide a sketch of the contaminated area identifying radiation and contamination levels.

Action: Safety

Date: Completed

- b. Remove contamination from the surface of the concrete paving to minimize the spread of radioactive contamination.

Action: Installation & Modification Branch

Date: Completed

- c. Determine if the soil is contaminated to soil depths exceeding 12 inches indicating the source of the radioactive material is below ground.

Action: I&M Branch

Date: Completed

RESULTS: Soil contamination was found at depths exceeding 12 inches with little reduction of measured surface radiation levels.

2. Core drill through the concrete paving directly over the probable source of the leak and at other locations to obtain radiation levels and soil samples for radioisotopic analysis to determine the extent of the radioactive soil contamination.

Action: I&M Branch

Date: Completed

RESULTS: Six 8-inch diameter concrete cores removed at locations shown in Sketch No. 2, show the highest surface radiation levels are present at a position estimated to be over an elbow in the waste line shown in Sketch 2.

1. UOR Number EG&G-85-17

2. UOR Date 11-13-85

15. Corrective Action: (Cont'd)

3. Evaluate leaking waste streams to determine the extent of discharge of "Hazardous" wastes potentially discharged to the soil at leak location.

Action: TRA Waste Coordinator

Date: Completed

RESULTS: An evaluation by the waste generators (i.e., TRA 632 Hot Cell and Chemistry Laboratories TRA 604 and TRA 661) of the discharges from their respective areas for the period December 1984 through May 1985, revealed that no "Hazardous" materials as defined under the Resource Conservation and Recovery Act (RCRA) were discharged during this period.

4. Perform a preliminary evaluation of the amount of radioactivity discharged to the soil as the result of this leaking waste line.

Action: TRA Waste Coordinator

Date: Completed

RESULTS: An examination of the analysis performed on the waste tanks prior to being pumped through the leaking waste line indicated that a total of 1.87 curies of long-lived fission products and fission product daughters had been pumped through the waste line since December 1984.

5. Remove a portion of the concrete slab over the suspected leak and excavate to expose the waste line and complete a repair of the waste line.

Action: TRA Waste Coordinator & I&M Branch

Date: Completed

6. Characterize the extent of migration of the liquid waste in the soil.

Action: TRA Waste Coordinator

Date: Completed

The extent of migration of the radioactive contamination under the concrete pad was characterized. An intrinsic Germanium detector, a multichannel analyzer and a tungsten collimator were used to evaluate photopeaks emanating from the contaminated soil. The attached sketch Number 3 identifies the boundaries of the underground contamination. It is obvious that the leakage from the waste line followed the adjacent firewater line trenches. The firewater line was installed in 1978.

The depth of the soil contamination was determined by driving a hollow pointed pipe into the ground at the bottom of the excavation and measuring the radiation levels inside the pipe. This investigation revealed that there existed a definite line of demarcation between contaminated and non-contaminated soil. The measurement revealed that this line of demarcation was located approximately ten (10) feet below grade. It is felt that this measurement adjacent to the leak location would represent the maximum depth that contamination would be found throughout the area with contamination.

1. UOR Number EG&G-85-172. UOR Date 11-13-85

15. Corrective Action: (Cont'd)

The total estimated volume of contaminated soil based upon the information presented in the previous two paragraphs is 350 cubic yards. Approximately 36 cubic yards of soil was excavated from the waste line and placed in disposal boxes for disposal at the Radioactive Waste Management Complex located at the Idaho National Engineering Laboratory. The radioactive soil remaining has a volume of 314 cubic yards. Soil samples taken during excavation indicate that the radioactivity concentration in the soil has an average concentration of $7.1\text{E-}3$ microcuries per gram. Therefore, the total activity remaining in the ground is 2.75 curies of fission products in the following approximate quantities: 2.34 Ci Cesium 137 (85%), .4 Ci Cesium 134 (14%), .1 Ci Strontium 90 (.5%), .001 Ci Cobalt 60 (.5%).

The source of the TRA drinking water is the aquifer located under the TRA at depths varying to several hundred feet. Three deep wells located near the north perimeter provide potable water for TRA personnel. These wells are located at least 1200 feet from the leak location upstream based upon normal ground water movement. The entire area of the leak is located under concrete slab. The slab will provide an effective seal minimizing further migration of the contamination. TRA well water is routinely sampled for radioactivity to assure water quality. Because of these facts, it was determined that the radioactive contamination should be left in place until a future decontamination can be performed.

7. Based upon the information identified from the characterization attempt, the decision was made to do the following:

1. Soil removed to uncover the waste line shall be boxed and disposed of as radioactive material.

Action: TRA Waste Coordinator

Date: Completed

2. No regulations or requirements were identified which require removal of the contaminated soil. Therefore, the remaining contaminated soil will be left in place.

16. Programmatic Impact:

None

17. Impact Codes and Standards:

None

1. UOR Number EG&G-85-17

2. UOR Date 11-13-85

18. Similar Unusual Occurrences Report Numbers:

EG&G-84-1

19. Signatures:

Originator: D. E. Sheldon Date: 11-13-85
D. E. Sheldon, TRA Waste Coordinator, PRP

Reviewed by: R. D. Boyer Date: 11-13-85
R. D. Boyer, Manager, Safety

Reviewed by: G. D. Alletzhauer Date: 11-13-85
G. D. Alletzhauer, Lead Quality Engineer,
Quality

Reviewed by: D. R. Mousseau Date: 11-13-85
* D. R. Mousseau, Manager, Technical Support

Reviewed by: W. Amidei Date: 11/13/85
* W. Amidei, Jr., Manager, TRA Maintenance
Operations

Approved by: J. A. Hong Date: 11-13-85
J. A. Hong, Manager, ATR Operations

*An EG&G Idaho Inc. reorganization resulted in organizational name changes on the signature list from those responsibilities identified in the body of the UOR.

EGS 95-17
A-3

TRA 611
PLUG STORAGE AREA

TRK SERVICES WIND

PERSONNEL
DOORS

TRUCK DOOR

DIRT

20 MR/HR

30 MR/HR

50 MR/HR

40 MR/HR

100 MR/HR

500 MR/HR

2 MR/HR

5 MR/HR

60 MR/HR

100 MR/HR

80 MR/HR

130 MR/HR

4 MR/HR

7 MR/HR

10 MR/HR

10 MR/HR

CRACK

2 MR/HR

3 MR/HR

.5 MR/HR

COLD
WASTE
DUMPSTER

35 MR/HR

COLD
WASTE
DUMPSTER

10,000 C/M

CRACK

10 MR/HR

30 MR/HR

SIDEWALK

PERSONNEL
DOOR

CONCRETE PAVING

TRA 632
HOT CELL BUILDING

PERSONNEL DOOR

BODY
FIELD

CONTACT
READING

C/M WITH LUDLUM 2A

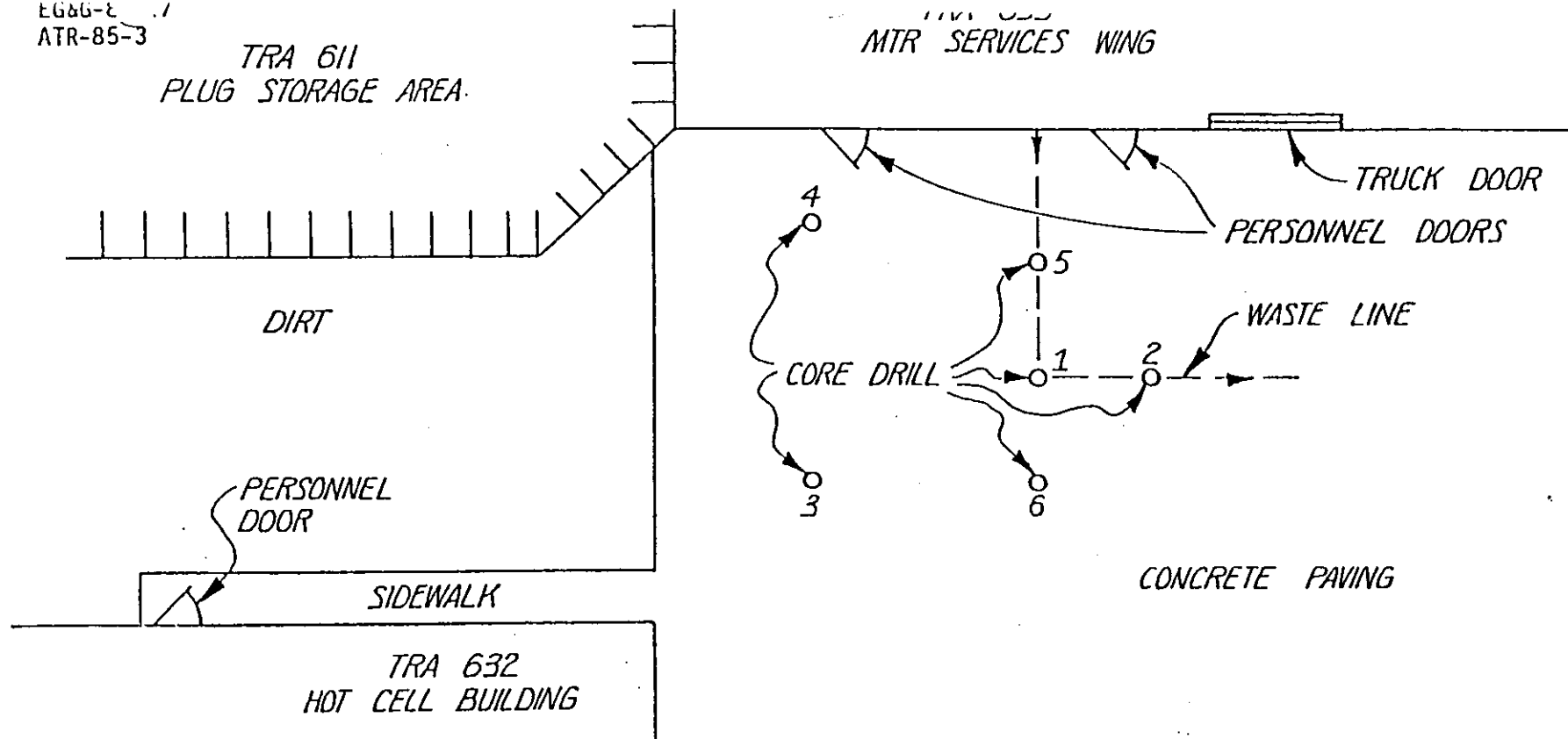
MR/HR WITH LUDLUM 14C

READINGS TAKEN AFTER PLASTIC AND
PLYWOOD IN PLACE

SURVEY 5-8-85 10:25 am
FMB SLK

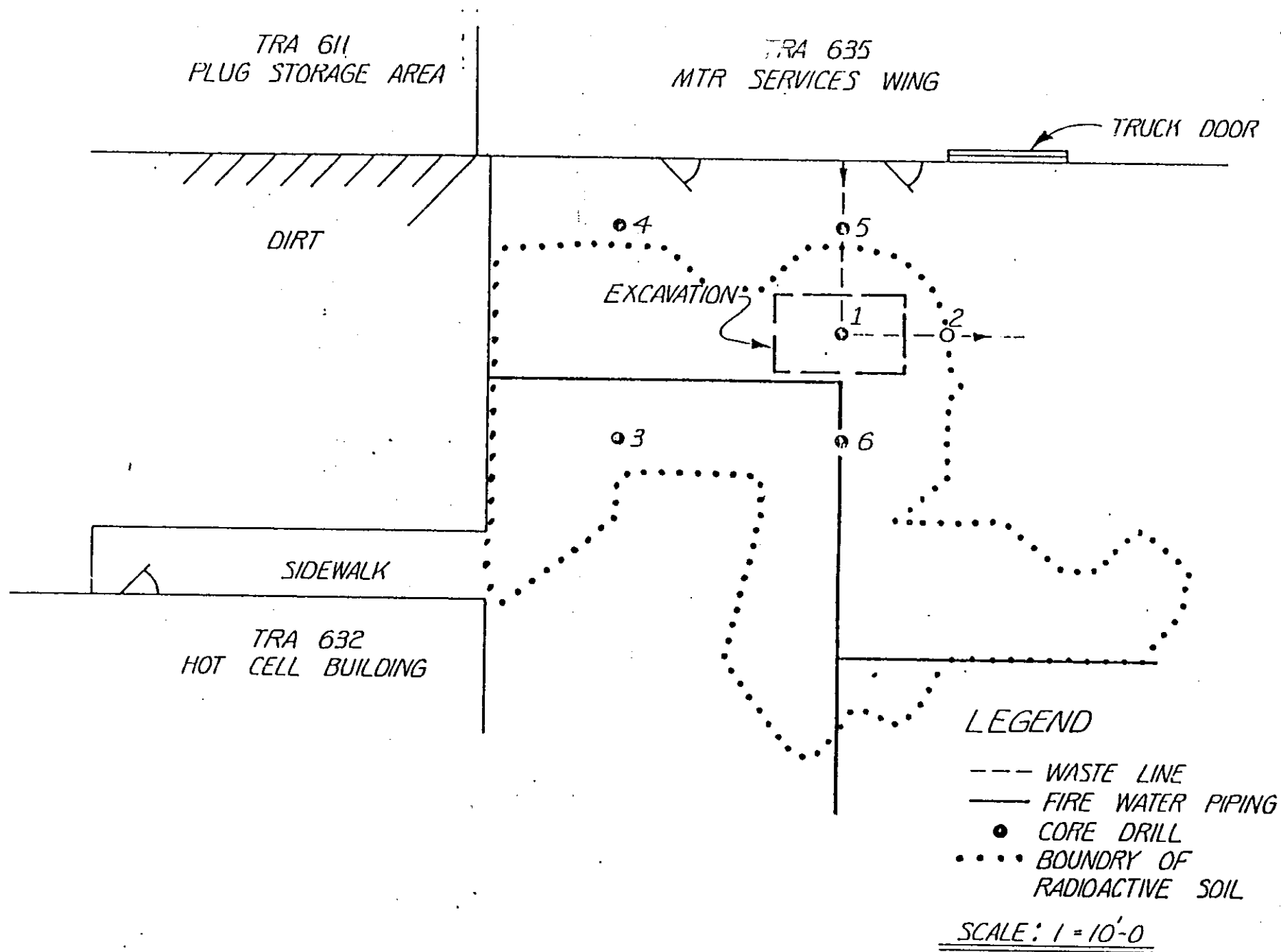
SKETCH 1

TRA 611
PLUG STORAGE AREA



HOLE #	BOTTOM	RADIATION LEVELS UNDER SURFACE					CONCRETE	RADIATION CONCENTRATION AT SURFACE ($\mu\text{Ci/gm}$)
		UP1'	UP2'	UP3'	UP4'	UP5'		
1	75 MR	550 MR	15 R	16 R	12 P	10 MR	300 MR	$1.3 \text{ E-}0$
2	0	0	0	0	0	0	0	$5.4 \text{ E-}5$
3	0	.1 MR	.2 MR	1 MR	10 MR	.4 MR	10 MR	$2.6 \text{ E-}2$
4	NR	NR	0	0	0	0	0	$1.9 \text{ E-}5$
5	0	0	0	0	0	0	0	$3.3 \text{ E-}6$
6	0	.6 MR	.6 MR	1 MR	10 MR	1.5 MR	20 MR	$4.0 \text{ E-}3$

SKETCH 2 DES-6-85



SKETCH 3 DES-6-85